

Endoscopic thoracic sympathectomy: Early, mid-term and late outcomes and patient satisfaction

Outcomes of endoscopic thoracic sympathectomy and satisfaction

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Abstract

Aim: This study presents the outcomes and patient satisfaction after endoscopic thoracic sympathectomy (ETS) applied to patients unresponsive to medical treatment.

Material and Methods: Sixty-one patients who underwent ETS for axillary/palmar hyperhidrosis from June 2010 to June 2019 were retrospectively evaluated. Data were collected from patient charts and files. Patient satisfaction and preoperative and postoperative changes in patient's social lives were assessed over the phone.

Results: The mean age of the included 61 patients was 23.2 ± 5.63 years, the mean length of the postoperative follow-up period was 27.3 months. Moderate-severe compensatory hyperhidrosis was observed in 2 patients. A significant majority of patients were satisfied with the surgery and they stated that would recommend it to others. The loss of self-confidence in the preoperative period was significantly restored in the postoperative period.

Discussion: ETS with the incision of the sympathetic chain at the T3-T4 level is associated with significant reductions in pain severity and compensatory hyperhidrosis and with significant patient satisfaction in the postoperative period. It should always be remembered that the likelihood of developing compensatory hyperhidrosis is high in patients over 30 years of age and that it occurs after the first postoperative month.

Keywords

Hyperhidrosis; Sympathectomy; ETS; Compensatory hyperhidrosis

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Introduction

Focal hyperhidrosis is a condition most commonly seen on the palm, armpits, face, and feet. The etiology of this condition has not been fully understood yet. Focal hyperhidrosis is aggravated by stress besides other physiological factors. The incidence of focal hyperhidrosis is around 1% and it is more common in young people in the population. This condition adversely affects the work and daily lives of patients [1]. Topical treatments, botulinum toxin injections, and the excision of the sweat glands are primarily attempted in focal hyperhidrosis but successful outcomes cannot often be achieved. While surgical treatment for these diseases was performed with thoracotomy previously, advances in technology and endoscopic techniques have allowed performing thoracic sympathectomy with videothoracoscopy. Thoracoscopic sympathectomy is most commonly used for focal hyperhidrosis followed by facial blushing and Buerger's and Raynaud's diseases. This technique is less painful and allows for returning to work early. Endoscopic Thoracic Sympathectomy (ETS) performed by cauterization or clipping is the most effective surgical intervention in the treatment of focal hyperhidrosis [2]. Also, this thoracoscopy-assisted surgery is associated with significantly less postoperative pain, short hospital stay, early return to work, and favourable aesthetic results. Although the outcomes of ETS are very good, the leading factors associated with poor patient satisfaction are compensatory hyperhidrosis (CH) and recurrences developing in some patients. Moreover, Horner Syndrome, prolonged air leak, and other general complications of surgery reduce patient satisfaction after the intervention.

In this study, we evaluated 61 patients who underwent ETS in the period from June 2010 to June 2019 using retrospective patient chart and file reviews and assessments over the phone.

Material and Methods

This study included 61 patients comprising 30 females and 31 males in the age range of 16-41 years, who did not respond to medical therapy, and who underwent ETS for the treatment of axillary/palmar hyperhidrosis at Necmettin Erbakan University, Medical Faculty of Meram and Omer Halisdemir University, Training and Research Hospital in the period from June 2010 to June 2019. Ethical approval was received from Omer Halisdemir University, Training and Research Hospital, Ethics Committee (Number: 2019/36) before the study started. A written informed consent was obtained from each participant. Chest X-rays were performed in all patients to exclude secondary causes. Blood samples of the patients were tested for hemogram, biochemical parameters, and thyroid functions. Patient consent was obtained provided that verbal and written information was provided to the patients about the possible outcomes and potential untoward effects of the operation before the surgery. Patient data and detailed information about the surgery that these patients underwent were collected by reviewing the patient files and charts. The outcomes of the surgery were assessed at outpatient clinic follow-up visits and by calling the patients over the phone (Table 1). The patients were evaluated by demographic data, the length of hospital stay, anaesthesia and surgery techniques, the length of the follow-up period, recurrences, complications, and patient satisfaction.

CH was graded as mild, moderate, or severe. Mild CH was defined as sweating that the formed sweat did not flow and no needs occurred to change clothes. Moderate CH was defined as sweating that did not require changing clothes, but the formed sweat coalesced into droplets that flowed. Nevertheless, it did not embarrass the patient despite being uncomfortable. Intense CH was defined as sweating with sweat droplets flowing profusely, necessitating a change of clothes one or more times a day. Hand dryness in the postoperative period was scored relative to a point of 10, which was arbitrarily attributed as the score of preoperative sweating. The first 30 days after the surgery was defined as the early term, the period between the first month of surgery to the 12th month was defined as the mid-term, and the period after the 12th month of surgery was defined as the long-term. Statistical analysis was performed using SPSS version 15.0 software. The study was conducted in compliance with the principles of the Declaration of Helsinki.

Surgical Technique

After the single- or double-lumen intubation with the administration of general anaesthesia, patients were brought to the Semi-Fowler's position. Then, the video-thoracoscopic surgery started. Thoracic sympathectomy was performed on the patients in the same or different sessions by thoracic surgeons. Access to the thorax was established by placing two or three 5 mm ports in the axillary region. Thoracic sympathectomy was carried out by cauterizing or clipping the sympathetic chain at different levels. Peripheral body temperature was measured in the preoperative and postoperative period in a group of patients. After the operation, the free air in the thorax was aspirated using an aspirator catheter, an underwater sealed drainage system was established, and the tubes were withdrawn at the end of the operation. After the extubation, the patients were transferred to the intensive care unit or to the inpatient ward. Appropriate analgesic, bronchodilator, and oxygen therapy were started. Chest x-rays and routine blood tests were performed in the first postoperative hour and before the hospital discharge. After the hospital discharge, the patients were evaluated via physical examination and chest X-rays at follow-up visits scheduled at regular intervals.

Results

ETS was performed on 61 patients (30 females, 31 males). The mean age of the patients was 23.2 ± 5.63 (16-41) years, the average height was 169.2 ± 7.9 cm, and the mean body weight was 64.9 ± 8.9 kg. Fifty-six patients were single and 5 were married. Twenty-eight patients were students and 36 patients were university graduates. Hyperhidrosis in first-degree relatives and second-degree relatives was found in 4 and 10 patients, respectively (Table 2). Two patients had psychiatric disorders, two had a goitre, one had polycystic kidney failure, and one had a substance use disorder. The mean length of postoperative hospital stay was 1.59 ± 2.1 days (1-16 days). The mean length of the postoperative follow-up period was 27.3 ± 24.8 (7-113) months. Fifty-seven patients had no history of previous thoracic surgery. Following the administration of general anaesthesia, single- and double-lumen intubation was performed in 31 and 30 patients, respectively. Videothoracoscopic surgery was performed in the axillary

Table 1. The patient assessment questionnaire

1	Indications	Palmar	Axillary	Plantar	Facial	
2	Satisfaction	Much better	A little better	The same	A little worse	Worse
3	Compensatory Hyperhidrosis(CH)	No	Mild	Moderate	Severe	
4	CH Location	Lower limb	Upper Limb	Head	Trunk	Abdomen
5	Recommend the surgery	No	Undecided	A little	Yes	Others
6	Where did you hear about the surgery?	Doctor	Tv-Radio	Patient	Social Media	Others
7	First outpatient clinic	Thoracic Surgery	Cardiovascular surgery	Endocrinology	Dermatology	Others
8	Increased sweating with spicy/bitter	No	Undecided	A little	Yes	Others
9	The loss of self-confidence in the preoperative period	No	Undecided	A little	Yes	
10	Severity of preoperative/Postoperative hyperhidrosis	10/10	x/10			

Table 2. Characteristics of Patients

Variable	N	%
Gender		
Male	31	51%
Female	30	49%
Age Groups		
10-19	15	25%
20-29	37	60%
30-39	8	13%
40-49	1	2%
Status		
Single	56	92%
Married	5	8%
Family History		
First Degree	4	6%
Second Degree	10	15%
Previous surgery		
	4	6%
Intubation		
Single-lumen	31	51%
Double-lumen	30	49%
Indication		
Palmar/axillary	48	79%
Palmar/axillary/plantar	13	21%
Surgery		
One-stage	63	94%
Two-stage	4	6%
Level		
T2-3-4	10	16%
T3-4	50	82%
T4	1	2%

region via two 5 mm ports (3 ports in a total of 7 interventions). A sympathetic blockade was performed by clipping in only one patient. The remaining 60 patients underwent sympathetic nerve cauterization. ETS was performed bilaterally in the same session on 57 patients for focal hyperhidrosis. The procedure was performed in two different sessions due to preoperative and intraoperative bradycardia each occurring in 2 patients. Forty-eight patients had palmar/axillary hyperhidrosis (Figure 1). One patient underwent emergency thoracotomy due to bleeding during left sympathectomy and 1 patient underwent axillary thoracotomy due to pleural adhesion. Pleural adhesion was observed intraoperatively in 10 patients. Partial pneumothorax

Table 3. The results of surgery

Variables	N	%
Pleural adhesion	10	16%
Pneumothorax	5	8%
Haemothorax	1	2%
Recurrence		
Mild	3	5%
Moderate	1	2%
Compensatory Hyperhidrosis(CH)		
Mild	11	18%
Moderate	1	2%
Severe	1	2%
Compensatory Hyperhidrosis Region		
Thorax	10	76%
Abdomen	1	8%
Head	1	8%
Lower limb	1	8%
Satisfaction		
Very satisfied	42	69%
Satisfied	16	26%
Moderately satisfied	2	3%
Dissatisfied	1	2%

was observed on the left in three patients and on the right in two patients on chest X-rays. Three of these patients were treated by tube thoracostomy. Persistent air leak due to right pleural adhesion occurred in a patient with severe substance use disorder. This patient was treated with tube thoracostomy and no further need emerged for major surgery. Intense CH developed in one patient and moderate CH developed in another patient. Eleven patients developed mild CH. It was observed that CH developed most commonly in the trunk and in the period between the 1st and 60th month after surgery. CH developed only in one (6%) out of 15 patients aged 10-19 years, in 8 (21%) out of 37 patients aged 20-29 years, and in 4 out of 8 patients aged 30-39 years. It was observed that the patient who developed severe CH, underwent sympathectomy at the level of T2-3-4. Recurrences were mild in 3 patients and intense in one patient. They occurred in the first 12th months after the surgery. Sympathectomy was at the T3-4 level in 50 patients, at the level of T2-3-4 in 10 patients. Another patient underwent partial T4 sympathectomy on the left side because

of vascular adhesion. Kuntz nerve cauterization was performed in all patients. The patients had presented most commonly to the outpatient clinic of the department of thoracic surgery (N: 47). It was observed that the patients became aware of the operation via social media (N: 35). Forty-two of patients who underwent surgery were highly satisfied, 16 were satisfied, and 2 were moderately satisfied. Only one patient reported dissatisfaction with the outcomes of the surgery (Table 3). A significant majority of patients were satisfied with the surgery and they stated that would recommend it to others. Spicy hot food did not aggravate sweating in 50 patients. The loss of self-confidence in the preoperative period was significantly restored in the postoperative period. The 10/10 severity of preoperative hyperhidrosis was found to be 0.9/10 in the postoperative period.

Discussion

Hyperhidrosis is a condition that was recognized in the past; however, the advances, especially in the fields of medicine such as anatomy and physiology, continue to lead to many hypotheses to identify the factors causing this disorder. Hyperhidrosis was present in the family members of every fifth patients in our study. The cause of hyperhidrosis has not been explained completely yet but it is a disorder characterized by the hyperactivity of the sympathetic nervous system, affecting human life and impairing the quality of life. This has led the researchers to look for different treatment options. Previous studies have reported that thoracic sympathectomy was performed by severing the sympathetic chain at more than one level. Owing to the rapid advances in technology and medicine, high success and satisfaction rates have been observed with videothoracoscopy. Despite the advances in surgical techniques, CH remains to be the most untoward condition faced by the patient and physician in the postoperative period. Moreover, the aetiology of CH has not been clarified yet. A study comparing the outcomes of unilateral/bilateral sympathectomy reported that, compared to bilateral ETS performed in a single session, the likelihood of developing CH was lower in unilateral ETS surgery performed at one side in a session (19% vs 4%) [3]. Another study compared the risk of developing CH by the level of sympathectomy and reported that T4 sympathectomy was associated with a lower risk of developing CH compared to T2 or T3 sympathectomy [4]. Another study suggests that T3 or T4 sympathectomy should be preferred for symptomatic treatment instead of T2 sympathectomy [5]. In our study, the rate of CH was 21.3% and only 3% of patients developed moderate and severe CH. We think that the low rates of CH in our study might have resulted from the fact that the majority of our patients were under the age of 30 and that T3-4 sympathectomy was performed. CH was significantly observed in the trunk of the patients (77%). We think that further studies are needed to investigate the reason for the occurrence of CH in the trunk area. Moreover, this untoward effect was observed from the 30th day to the 60th month after the surgery. In an effort to explain this finding, we can comment that a period is needed for the metabolism to recognize the failure to tolerate the unmet physiological need for sweating. We observed that the likelihood of developing CH increased with increasing age. Although the

physiopathology of this increase is not fully understood, we think that physiological sweating is shifted to the palms or to the axilla with the advancing age. We recommend surgery for the patients because the potentially developing CH occurs at lower rates, at tolerable levels, and at levels not unfavourably affecting the daily lives of individuals.

Studies in the literature have shown that changes in cardiac parameters may occur after sympathectomy [6]. We decided to perform the operation in different sessions in 4 of our patients because of bradycardia that emerged either in the preoperative or intraoperative period. However, the absence of abnormal cardiac findings in these patients after the surgery may indicate that T3-4 sympathectomy does not significantly affect cardiac parameters.

Both the physical and psychosocial aspects of quality of life were affected in hyperhidrosis patients. This situation can often cause functional disabilities that affect work, daily activities, social status, personal relationships, and sexual activities of these individuals [7]. Compared to the normal population, these patients have high levels of anxiety, social phobia, and depression [8]. A study by Vasquez et al. reported the therapeutic potential of ETS in addressing the difficulties associated with primary focal hyperhidrosis, improving the quality of life and alleviating anxiety and social phobia [9]. Forty-two patients who underwent surgery were highly satisfied, 16 were satisfied, and 2 were moderately satisfied. Only one patient who underwent left thoracotomy, reported dissatisfaction with the outcomes of the surgery. Consistent with the literature, the loss of self-confidence and social phobia in the preoperative period was restored in 90% of our patients in the postoperative period.

Because ETS is a cosmetic surgical intervention, potential complications of ETS may be less tolerated compared to those developing after other major thoracic surgery. Several factors may cause the development of complications. One of the major reasons causing difficulties during surgery is the presence of pleural adhesion. The incidence of pleural adhesion varies from 1.3 to 6.4% in the literature [10]. In our study, this rate was found to be significantly high (16%). We think that the socioeconomic level in our country and the associated high likelihood of acquiring pneumonia and tuberculosis in childhood may be associated with this difference in the observed rates.

Pneumothorax, which is one of the minor complications, is more commonly observed compared to major complications but it can usually be absorbed spontaneously with oxygen therapy. Rarely, tube thoracostomy and/or major surgery may be necessary. In a study conducted in Taiwan, pneumothorax was observed at a rate of 14.1% on the chest x-rays taken after ETS. Among those patients, only 2.6% required tube thoracostomy [11]. In our study, the rate of postoperative pneumothorax was found to be 8% in agreement with the literature. Major complications after ETS are rare but they can be lethal. In a series of 940 procedures published by Gossot, it was reported that 25 cases required axillary thoracotomy due to a right subclavian artery injury and significant venous bleeding [12]. Again, Kwon et al. reported that a patient who developed chylothorax required a second surgery [13]. In our study, aortic injury developed during the left sympathectomy in one patient for whom a bilateral ETS was planned. This patient was treated with left

thoracotomy. In another patient, the operation was completed with axillary thoracotomy because significant pleural adhesion was observed during the left sympathectomy. Although the postoperative measurements of the peripheral temperature showed a tendency to increase in the study patients, it was not possible to obtain adequate data to confirm this finding.

Postoperative recurrences occurred, but mildly in 3 patients. In the patient with pleural adhesion, hyperhidrosis recurred significantly on the right. We think that the development of recurrence after the 30th day of surgery may be related to the postoperative activation of the thin nerve fibres around the sympathetic chain. This was found to be a major factor affecting patient satisfaction with surgery. In the literature, Drott and Claespersitan report that persistent sweating, and delayed sweating occurred at rates of 1.5% and 2%, respectively [14]. We think that another reason for the lower recurrence rate in our patients may be the complete severance of the sympathetic chain by cauterization in 98% of the operations.

A study by Peter et al. reported that hyperhidrosis due to the consumption of spicy and acid-rich food could develop at a rate of 32% after sympathectomy. Furthermore, the investigators reported that the rate of 32% was associated with the width of the sympathectomy level [15]. We found this rate as 2% in our study; however, further studies are needed to explain the factors resulting in this effect.

Conclusion

ETS with the incision of the sympathetic chain at the T3-T4 level is associated with significant reductions in pain severity and compensatory hyperhidrosis and with significant patient satisfaction in the postoperative period. It should always be remembered that the likelihood of developing compensatory hyperhidrosis is high in patients over 30 years of age and that it occurs after the first postoperative month.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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